Sustainability in Residential Construction: Homeowner Input on Sustainable Features

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Recently, sustainability has become extremely popular in construction, and in particular residential construction. Regulations for sustainable construction have increased over the years and have begun to increase in popularity amongst homeowners. This report dives further into the importance of sustainability in residential construction, in particular working with homeowners to identify the best methods of increasing sustainability in their homes. Currently, little information has been published regarding homeowners' perspectives on sustainability and the types of features they would be likely to incorporate into their homes that are not mandated by codes. This report serves to provide information to both the construction industry as well as real estate agents on the top 5 sustainable features homeowners want to incorporate into their homes. From the 4 conducted interviews of real estate agents, we were able to understand their perspective on homeowner's knowledge and desire about sustainable elements in their homes. Using that information and creating a survey for homeowners we found homeowners actual knowledge, what they look for in a home and finally the top 5 sustainable features they would be most likely to incorporate into their homes. These features were smart meters, solar panels, drip irrigation systems, energy star appliances and high-performance windows.

Key Words: Sustainability, Homeowners, Sustainable Features, Real Estate Agent, Proactive Approach

Literature Review

Both globally and in the United States, the construction industry is one of the main contributors to the depletion of natural resources and a major cause of unwanted side effects such as air and water pollution, solid waste, deforestation, toxic wastes, health hazards, global warming, and other negative consequences. This problem has become a growing issue that has spurred interest to change the way construction is done and making homes more sustainable.

Buildings and their construction together account for 36 percent of global energy use and 39 percent of energy-related carbon dioxide emissions annually (UN Environment). Focus has shifted from standard building strategies to green buildings to address concerns about the consumption of energy and natural resources. As a result, we have seen an increase in green building codes all throughout the United States. Given that the conventional buildings have played a key role in such unprecedented levels of pollution, the green building approach has emerged as an alternative that can help households live in environmentally sustainable houses.

Sustainable and green building is a concept that has drastically grown over the years and has taken a major leap forward especially in residential construction. LEED Core Concepts Guide identifies green building as a process that applies to buildings, their sites, their interiors, their operations, and the communities in which they are situated. It is a process that flows throughout the entire life cycle of a project, beginning at the inception of a project idea and continuing seamlessly until the project reaches the end of its life and its parts are recycled or reused. There are many steps however that must be taken in order to identify a home to be sustainable. According to Hsieh, Claresta & Bui (2020) in order for a real estate development to be regarded as a green building, acquisition of green certification by the Leadership in Energy and Environmental Design as well as Energy Start is mandatory.

According to Zheng, Kahn & Deng (2012), incorporating environmentally friendly technologies and improving green buildings is a proven way that can be implemented by real estate developers to minimize the negative carbon footprint from real estate properties. This is a growing interest among homeowners. They want to make a difference. In recent years, the well-being of the earth and what we are doing to it has become a major concern amongst Americans, which is why we have seen a paradigm shift in the real estate housing market. According to a poll conducted by The Washington Post and the Kaiser Family Foundation, 76% of Americans see pollution and energy consumption as a major problem and crisis. And 85% of Americans believe that sacrifice is necessary in order to combat this devastating problem.

In Williams and Dair's paper, *A framework of sustainable behaviors that can be enabled through the design of neighborhood-scale developments*, they suggest that there are two types of sustainability associated with green development. The first that is not the focus of this paper but is still important to understand is "technical sustainability." This is the concept of being sustainable through the use of building materials and construction methods. The second, that we are focusing on is "behavioral sustainability," which is reflected by the behaviors of residents living in them. A sustainable home no matter how well built, can only be truly effective if the residents are utilizing these elements correctly and exhibiting behavioral sustainability.

With the increase in importance of sustainable building in construction, particularly in residential construction, it is important to understand the homeowners perspectives and knowledge about sustainable practices in the. Understanding how to target consumers and identify what sustainable features they are more likely to incorporate into their homes and are more willing to purchase is of utmost importance. Instead of only incorporating the minimum amount of sustainable features that are mandated by code, it is important to take a proactive approach and get homeowners to incorporate features that are not mandatory. It is important to understand homeowners knowledge on sustainability, as well as the type of sustainable features they are attracted to in order to target those consumers. Understanding the end user and catering homes to them is the ideal goal in order to create more sustainable homes that people are attracted to and will utilize efficiently.

Research Goals and Objectives

The project is aimed at understanding the homeowner's perception of sustainability in the real estate housing market, as well as get their insight as to what features they are looking for in a home and are more willing to incorporate. Through the interviews with real estate agents, an understanding of the current problem and disconnect between the end user and their willingness to incorporate sustainable features in their homes will be found. Then with that justification, the survey will gauge what homeowners are looking for in a home and what sustainable features they will be more likely to incorporate and utilize in their homes. With the increase in importance of sustainability, this study will help to find out the considerations potential homeowners have when they are deciding to purchase a home. Through such an approach, the study will be able to conclude what features homeowners want to incorporate into their homes and allow for a more proactive approach to sustainability.

Research Methodology

The research will utilize qualitative and quantitative methods to gather the necessary data for explaining the importance of sustainable building as well as understanding homeowners perception of sustainable practices and what features they are willing to incorporate into their homes. Research alone will not be enough to understand this. I will need to conduct surveys asking both analytical and descriptive questions to test their knowledge on sustainability. The survey will test homeowner knowledge on sustainability and get their perspective on its importance. In the survey I will also be putting a list of the top 10 sustainable features that are not required by code in a home, as well as information about the added costs and payback periods, and see which of them (the top 5), homeowners are interested in and are willing to implement into their home. I will also be conducting interviews with a real estate agent to get their perspective as to whether or not sustainability is something homeowners are asking about. I will understand their perspective about the situation in the industry justify the importance of a survey to homeowners.

Methodology

Interview Question for Realtors

1. Are homeowners knowledgeable about sustainable features in the home you are showing them?
2. Do homeowners make an effort to ask about sustainability features of the home?
3. From your experience are homeowners willing to pay more for a sustainable home?
4. What type sustainable features are homeowners drawn to and why?
5. How do you believe we can improve homeowner's knowledge on sustainability?

Interview Question for Homeowners

1. In your own words what is sustainability
2. Why do you believe that sustainability is important?
3. Do you believe you can affect the environment for better or worse?

4. Do you believe housing, people's homes and the way they utilize their home affect the environment? If so, how.
5. Do you believe sustainable construction is becoming more popular?
6. When purchasing your home was sustainable features something you looked into and if so which
7. Why choose a home that is not sustainable over a home that is?
8. Do you believe that sustainable homes are more expensive? Please explain
9. Are you willing to spend more upfront on sustainable features in a home?
10. Out of these 10 sustainable features please select the top 5 you would incorporate into your home.
    1. Install solar panels
    2. Install high-performance windows.
    3. Install a smart meter
    4. Install a drip irrigation system
    5. Install a cool roof
    6. Install green roof
    7. Energy Star Appliances
    8. Eco Paint
    9. AMX Technology
    10. Energy efficient geothermal heat pump

Results

Interview Question for Realtors Summary:

1. **Are homeowners knowledgeable about sustainable features in the home you are showing them**

After conducting the interview, I was able to conclude that there are some homeowners that are quite knowledgeable about the different sustainable features in a home and the importance of them, but most homeowners do not know about a lot of them and really understand what they are each doing.

2. **Do homeowners make an effort to ask about sustainability features of the home**

It is about 50/50 with people asking about sustainable features and not. The majority of homeowners are interested in if the features are better and their cost benefits. The number of people who are interested in these features has increased over the years. Sustainability is something that many people are drawn to even if they do not fully understand all of its components.

3. **From your experience are homeowners willing to pay more for a sustainable home**

A majority of homeowners will need some background information about the sustainable features in the home. If they understand the long-term benefits associated with the home, they are much more likely to purchase it at a premium. Some people will pay more regardless because they know its adds value to a home. The group of people who are willing to pay a premium for sustainable homes are the younger generation who are more invested in the environment.

4. **What type of sustainable features are homeowners drawn to and why?**

Most common are solar panels and smart cooling and heating systems. These are features that are being talked about, which is why people want them. There has been a recent interest in Energy Star-rated appliances as well as efficient control systems for heating and cooling. These are the features that people want because they are proven to be efficient ways to save on utility bills.

5. **How do you believe we can improve homeowner's knowledge on sustainability?**

Realtor 1: It is a difficult question to answer. Homeowners have definitely become more aware of the importance of sustainability, but that does not mean that the information they need is accessible to them. It is not the real estate agents who put the sustainable features in a home, but it is our job to explain it to them. I believe that there should be more communication between construction to the selling aspect and then to the end user.

Realtor 2: I wouldn't say that homeowners are knowledgeable about sustainability, but they have quite a basic level of understanding. They only know about the sustainable features they hear about or see are becoming more popular. I think it is important to teach homeowners about potential features to add into a home, because the housing market is based around them. If more and more people want these features in their homes, they will begin to be implemented much more frequently. As to how to inform homeowners about these features, I think your idea of a pamphlet with the best and most useful features is a great start.

Realtor 3: I am not exactly sure how to improve homeowner's knowledge on sustainable building because it is pretty tough to get the information out there to them and then for them to absorb and really accept it. Just hearing about how sustainability is good and will benefit both them and the environment isn't enough in my opinion. For people to really accept it and want to take an active approach, they need to see results firsthand and to see that it does make a difference.

Survey Question for Homeowners Summary:

Total Survey Responses 35

1. Understanding of Sustainability
    a. Great Understanding: 6
    b. Some Understanding: 24
    c. No Understanding: 5

2. Is Sustainability Important?
    a. Yes: 33
    b. No: 2

3. Personal Effect on the Environment
    a. Yes: 27
    b. No: 8

4. Does utilization of a home affect the environment?
    a. Yes: 29

a. No: 3
b. Possibly: 3

5. Is sustainable construction more popular?
   a. Yes: 18
   b. No: 3
   c. Possibly: 14

6. Did homeowners look into sustainability when purchasing their home?
   a. Yes: 21
   b. No: 14

   Most common:
   1. Solar panels
   2. Irrigation system

7. Why not go with a sustainable home?
   a. More common and accessible
   b. Cheaper

8. Are sustainable homes more expensive?
   a. Yes: 32
   b. No: 3

9. Willing to spend more upfront on a sustainable home?
   a. Yes: 25
   b. No: 10

10. Top 5 out of 10 most desirable sustainable features.
    1. Smart Meter
    2. Solar Panels
    3. Energy Star Appliances
    4. Drip Irrigation System
    5. High Performance windows

Analysis

Realtor Interviews:

The purpose of the interviews was to gauge whether or not a survey would be beneficial in understanding homeowners' perspective on sustainable construction and what features they would like to incorporate into their homes. Realtors believe that there are a few portions of homeowners that understand sustainability in construction, its importance and benefits, but a majority of homeowners do not. They may understand that sustainability is a good thing, but do not really understand why. This shows that it is important to find a way to convey the importance of sustainability to homeowners and make them understand why we need to strive towards more sustainable construction and homes and teach them the importance of the role they play.

From the realtor's experience when selling homes, they believe that around 50% of homeowners make an effort to ask about sustainable features in the home they are looking at, while around 50% do not. This shows that homeowners are interested in sustainable features and want to make sure the home has features they are interested in or that they are just curious about sustainable features and just do not have enough information about them. Sustainability is something that many people are drawn to even if they do not fully understand all of its components.

Realtors also believe that a majority of homeowners are willing to pay more money for a sustainable home. If homeowners understand the benefits of a sustainable home, both economically and environmentally, they are much more likely to pay that extra amount which is why it is important to inform them. There are homeowners however who will pay more regardless of their knowledge about sustainable features because they understand the value it adds to a home. From what they have seen, it is the younger generation who are more invested in the environment are more likely to pay a premium for sustainable homes.

A majority of homeowners are interested in the sustainable features that are quite common and that they know about. They are interested in features that they know are beneficial from worldwide experience and their personal knowledge. These features are solar panels, irrigation systems and more recently Energy Star rated appliances. Realtors believe that these are the most common and desired features because they are directly related to utility bills and will reduce the cost of living for homeowners.

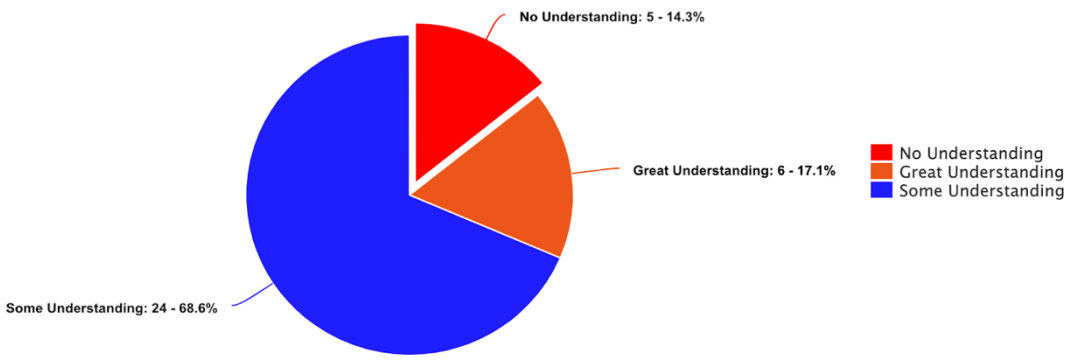
Overall real estate agents find it difficult to perfect a way of increasing homeowner knowledge about sustainable practices and features in a home. They agreed that a majority of homeowners have a general knowledge about sustainability, but do not know it's true value. Homeowners are knowledgeable about features that are very common, and they are becoming popular. The real estate agents agree that it is important to teach homeowners about other features that are not popular and well known because they are the ones that will ultimately cause an increase in sustainability in the housing industry. If homeowners want these other features, developers will begin to incorporate more of them in homes. It is important for homeowners to really accept sustainability and want to take an active approach. But in order to achieve this, they need to see results firsthand and see that these features truly make a difference.

Homeowner Surveys:

The survey sent out to new homeowners in the past 5 years was used to test many aspects of homeowners perception of sustainability. It looks at: their understanding of sustainable features in a home, their perspective on sustainable construction, whether or not they are willing to spend more on a sustainable home and the top 5 features they would be interested in incorporating into their. The survey consisted of 10 different questions to find the answers to these main concepts and to gauge whether or not they are interested in sustainability in construction.

From the survey we were able to conclude that a majority of homeowners, 68.6%, have some understanding of sustainability and its relationship to construction, while 17.1% have an above average understanding and 14.3% do not really know what the basis of sustainability is. The survey didn't ask a yes or no question but asked to define sustainability and from their answer were placed into one of these categories. The information is shown in Figure 1.1 below and can help better gauge homeowners understanding of sustainability.

Figure 1.1 **Homeowner Understanding of Sustainability**



The survey was also very helpful in understanding homeowners ideas about sustainability and if they believe it is important. The survey showed that 33 out of the 35 homeowners believes that sustainability is important and is a concept worth investing in. It also showed that 27 out of the 35 homeowners believe that they as an individual can affect the environment for better or worse. A majority of homeowners also believe that the way in which they utilize their home can affect the environment. This is extremely important because it shows that homeowners want to make a difference and will be willing to take the proactive approach in incorporating sustainable features in their homes. This can be seen in figure 1.2 and 1.3 below.

Figure 1.2 Is Sustainability Important?

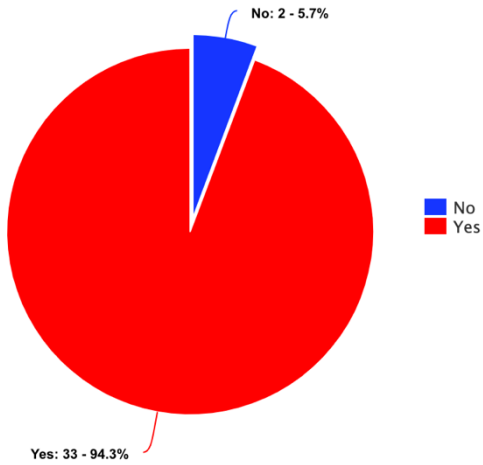
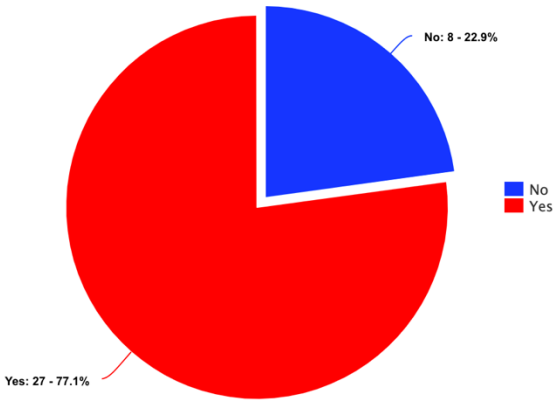


Figure 1.3 Can You Affect the Environment?



The next component of the survey was used to further understand what homeowners thought about sustainability and its future in construction. 18/35 homeowners believe that sustainability is becoming more popular, while 14/35 were unsure. In general, however people do see a future in sustainable construction and believe that the industry will continue to grow and incorporate more sustainable practices and features into constructing a home. The survey also aimed to see if sustainability was a

component of a home that they researched and looked into before purchasing one and which features in particular. 21/35 homeowners stated that they did look into sustainable features in a home and it was part of their decision making. Those 21 homeowners all mentioned similar features that they looked into, which were solar panels and irrigation systems. This is in direct agreement with what the real estate agents said in the interviews. They believed that homeowners look into sustainable features that are popular and are proven to save money for them. Those features are typically ones that are related to utility bills.

Another major part of the survey, which is one of the most important parts, was used to understand if homeowners believed a sustainable home is more expensive than a normal one. When asking homeowners why not choose a sustainable home, there were two common answers; because it is more expensive and it is harder to find sustainable homes on the market. They stated that a majority of homes they are being shown do not have many sustainable features incorporated into them. This is quite an important finding because it shows that there is some sort of disconnect between what homeowners are looking for in a home and what is being produced and offered. Out of the 35 homeowners surveyed, 32 believed that a sustainable home is more costly than a typical home. This is quite an important finding because this would cause people to not want to purchase a sustainable home solely based on the idea that it is more expensive. This shows that they need to be educated and informed on benefits, especially cost benefits associated with a sustainable home in the long run. Even though 91.4% of homeowners believed that a sustainable home is more expensive, 25 of the 35 would be willing to pay more for a sustainable home. This number would increase if they truly understood potential savings associated with a sustainable home. These findings can be seen below in figures 1.4 and 1.5.

Figure 1.4 Are Sustainable Homes More Expensive?

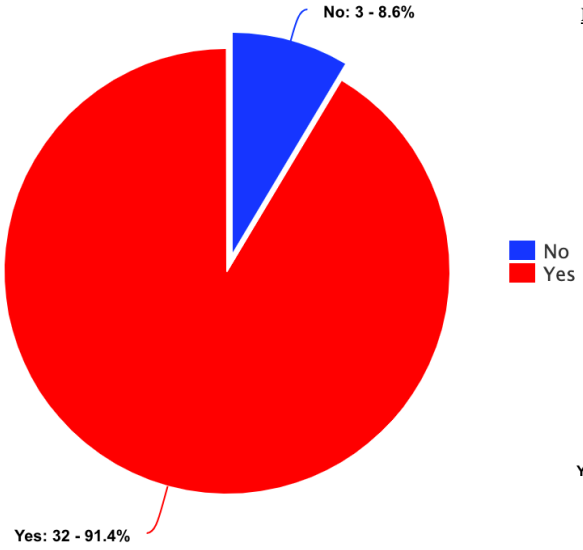
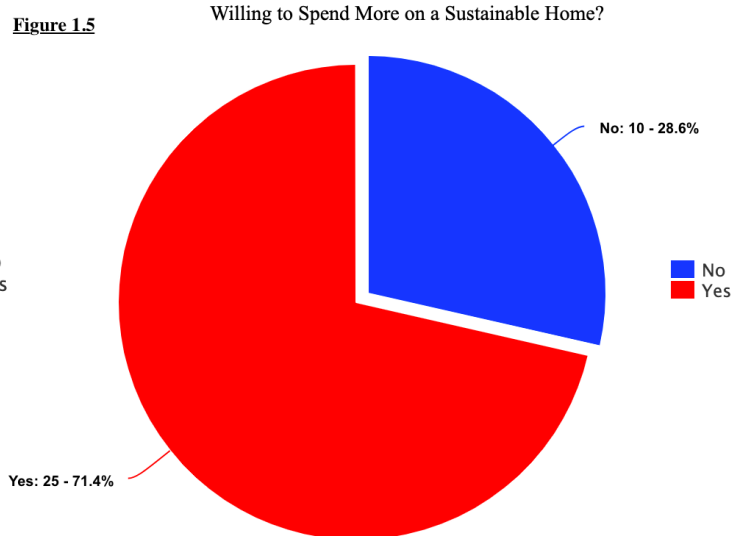


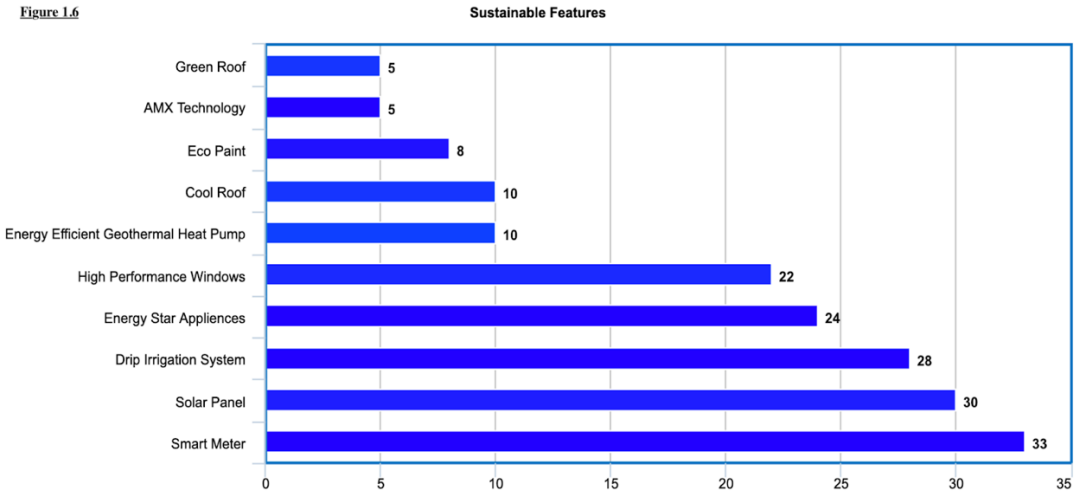
Figure 1.5 Willing to Spend More on a Sustainable Home?



Finally, we can look at the top 5 sustainable features homeowners were interested in incorporating into their homes. The options included: Solar panels, high-performance windows, smart meter, drip irrigation system, cool roof, green roof, Energy Star Appliances, eco paint, AMX technology and energy efficient geothermal heat pump. We can see the results from the survey in figure 1.6 below.

We can see that the top 5 sustainable features homeowners are interested in are smart meters, solar panels, drip irrigation systems, energy star appliances and high-performance windows, all respectively. With understanding what the top 5 features homeowners are interested in, we can find a way to incorporate these desired features into the home and then inform both homeowners who are real estate agents about these features and try to publicize and get them out there. The intent was to originally send out a pamphlet about these top 5 features to real estate agents to give to the potential homeowners they are showing. With understanding what features homeowners desire, we can begin to incorporate these features and help homeowners take a proactive approach to better incorporate sustainability into homes.

Figure 1.6



Conclusion

People have become more aware of the impact people have on the world and environment around us. Residential buildings and construction constitute a significant source of environmental concerns in terms of environmental waste, pollution and other negative effects. Through the study that I have conducted on both real estate agents in California as well as new, a lot of new insight has been gained. The interviews with the real estate agents informed us that about 50% of homeowners ask about sustainable features in a home and that they do have a general basic knowledge of sustainability. From the questions they asked and the features the homes had, we could conclude that most homeowners are interested in the “popular and common” features that are well known. These features are proven to save them money and directly correlated to utility costs. From the homeowners survey, a lot of useful information about homeowners perspective on sustainability was discovered. A majority of homeowners have a basic understanding of sustainability and understand its importance. Most homeowners believe they can personally affect the environment through their actions and the way they utilize their homes. I could conclude that the main reason sustainable homes are not chosen are its misconception about being much more expensive and the fact that they are not extremely common in the homes they are being shown. Finally, we were able to understand what types of features homeowners were attracted to and want to incorporate into their homes. This will allow for a more proactive approach to sustainable building in residential construction.

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